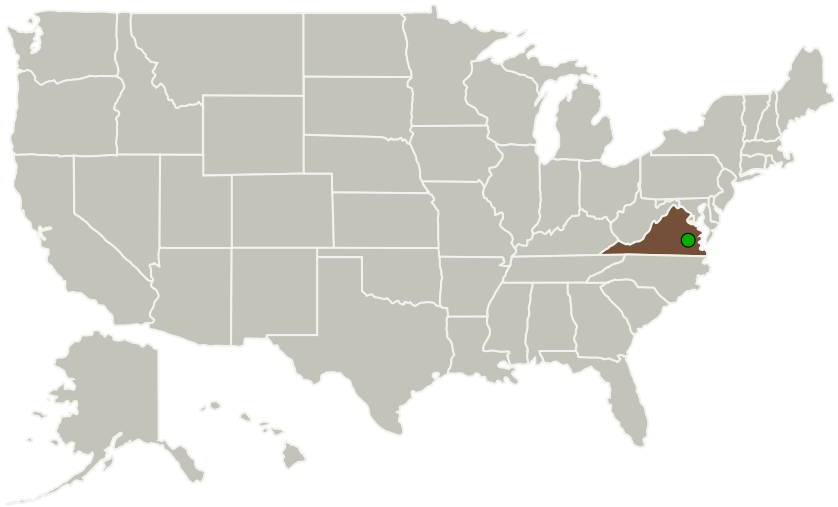
High Hydrogen Thoraeus Rubber Gossamer Radiation Shielding for Human Protection, Phase I

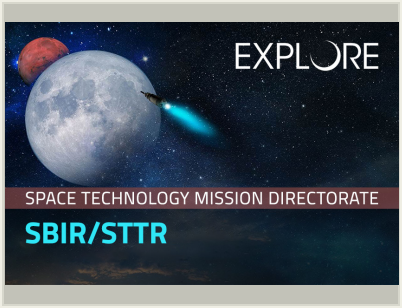
Completed Technology Project (2015 - 2015)

Project Introduction

NanoSonic has recently developed ultra-lightweight, durable, high hydrogen containing Thoraeus Rubber™ nanocomposites that may serve as radiation protection for space transportation vehicles as well as astronauts against DNA damaging high-energy particles and ionizing radiation. Thoraeus Rubber maximizes shielding with minimum bulk by grading alternating high and low atomic number (Z) nanoparticles within an energy dissipating hydrogenous neutron shielding polymer network to slow high-energy neutron elastic collisions and absorb resultant gamma rays, X-rays and high-energy particles. For comparable mass and areal densities, Thoraeus Rubber attenuates twice the level of gamma radiation under a 137Cs source relative to the COTS product and Ta at one-fourth the mass density, and with zero secondary ionization. The TRL of Thoraeus Rubber shall be increased from 3 - 5 via measurements at Brookhaven Radiation Effects Facility through our radiation expert and Certified Health Physicist partner at Colorado State University (CSU). TRL 7 shall be reached during Phase II upon space habitat construction and flight-testing with our space prime partners. TRL 9 shall be attained upon demonstration of Thoraeus Rubber on space vehicles traveling with humans through low Earth orbit (LEO), geosynchronous orbit, Moon, Mars, and the Asteroids that enable NASA's Human Exploration goals.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Nanosonic, Inc.	Lead Organization	Industry	Pembroke, Virginia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Virginia

Project Transitions

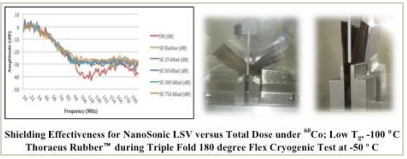
June 2015: Project Start

December 2015: Closed out

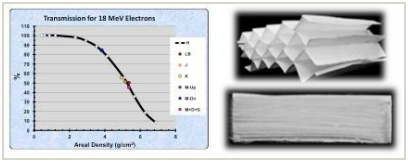
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139052)*

Images



Briefing Chart
High Hydrogen Thoraeus Rubber Gossamer Radiation Shielding for Human Protection Briefing Chart *(https://techport.nasa.gov/image/127087)*



Final Summary Chart Image
High Hydrogen Thoraeus Rubber Gossamer Radiation Shielding for Human Protection, Phase I Project Image *(https://techport.nasa.gov/image/135617)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Nanosonic, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

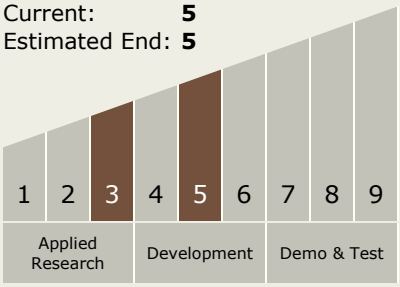
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Jennifer Lalli

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Completed Technology Project (2015 - 2015)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.5 Radiation
    - TX06.5.3 Protection Systems

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System